Particle filter Simulation and Analysis Enabling Non-Traditional Navigation Project

Completed Technology Project (2011 - 2012)

Project Introduction

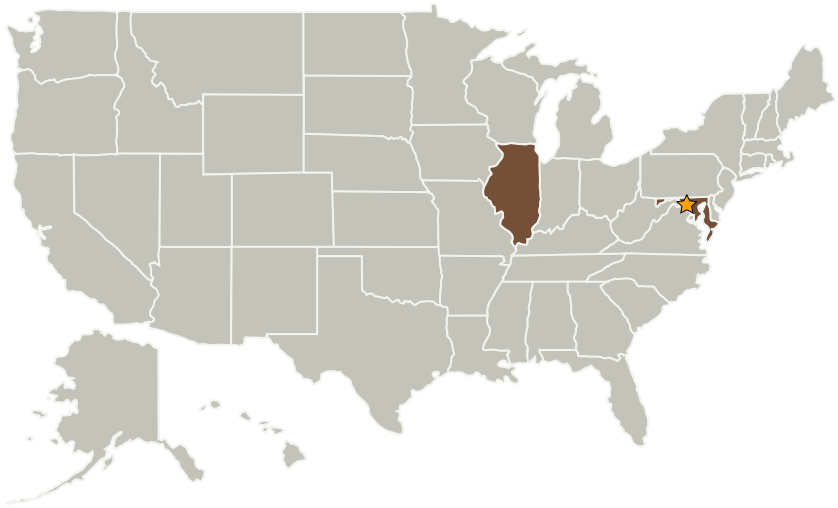
Particle Filters (PF) maintain a large cloud of separate estimates, or particles. PF's are potentially better able to handle significantly non-Gaussian errors, such as occur in conjunction prediction and orbit determination with event-driven disturbances. From among the wide range of possible PFs, we are investigating the approach best suited to NASA's non-traditional navigation challenges.

Incorporate PF into GSFC's Orbit Determination Toolbox (ODTBX). Augment PF with ODTBX' unique ability to partition error sources into subspaces for analysis. Utilize multi-core server to facilitate fast simulation of large particle populations.

Anticipated Benefits

More reliable predictions of conjunctions that are many orbit revolutions in the future.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Purdue University-Main Campus	Supporting Organization	Academia	West Lafayette, Indiana

Primary U.S. Work Locations	
Illinois	Maryland

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

John C Adams

Principal Investigator:

Russell Carpenter

Co-Investigator:

John A Gaebler

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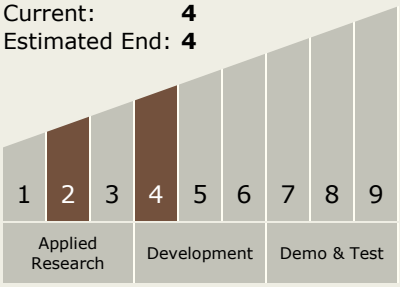
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.1 Onboard Navigation Algorithms

Other/Cross-cutting:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.X Other Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.2 Ground-based Navigation Algorithms